R E P O R T

December 8, 2015
15-1090 S

EXPLORATIONS AND GEOTECHNICAL ENGINEERING SERVICES

Proposed Addition to Terminal & Parking Area
1011 Westbrook Street
Portland, Maine

SUBMITTED TO:
Northeast Airmotive
Attention: Mark Goodwin – General Manager
1011 Westbrook Street
Portland, ME 04102

PREPARED BY:
S. W. Cole Engineering, Inc.
Paul F. Kohler, P.E.
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S.W.COLE ENGINEERING, INC.

- *Geotechnical Engineering*
- *Construction Materials Testing and Special Inspections*
- *GeoEnvironmental Services*
- *Test Boring Explorations*

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Northeast Airmotive
Attention: Mark Goodwin – General Manager
1011 Westbrook Street
Portland, ME 04102

Subject: Explorations and Geotechnical Engineering Services
Proposed Addition to Terminal and Parking Area
1011 Westbrook Street
Portland, Maine

Dear Mark:

In accordance with our Proposal dated October 30, 2015, we have performed subsurface explorations for the subject project. This report summarizes our findings and geotechnical recommendations and its contents are subject to the limitations set forth in Attachment A.

1.0 INTRODUCTION

1.1 Scope and Purpose

The purpose of our services was to obtain subsurface information at the site in order to develop geotechnical recommendations relative to foundations and earthwork associated with the proposed construction. Our scope of services included the making of five test boring explorations, laboratory testing and geotechnical analysis of the subsurface findings and preparation of this report.

1.2 Proposed Construction

The site is located at 1011 Westbrook Street in Portland, Maine on the easterly side of Westbrook Street, just northeast of the existing Jetport parking garage. The general site area is currently occupied by the existing Northeast Air terminal building, a one story rectangular building (former Jetport terminal building) and paved parking area.

We understand development plans call for demolition of the existing rectangular building (former Jetport terminal building) located on the northerly side of the existing Northeast Air terminal building and construction of a new paved parking area with an underdrained filter basin in the central portion of the proposed parking lot. The building to be razed is single-story, on the order of 45 by 150 feet in plan dimensions and appears to have a daylight basement elevation about 5 feet below existing exterior grades. The proposed finish pavement surface will vary from about elevation 59 feet to 62 feet (project datum) which is within about 1 foot of existing pavement grade. The filter basin will have a bottom elevation of 57 feet.

A one level, high bay, steel-framed addition is planned on the northerly side of the existing Northeast Air terminal building. The addition will have a finish floor elevation of 59.2 feet, matching the existing terminal. We understand the addition will be on the order of 45 by 80 feet in plan dimensions and will be structurally independent of the existing terminal building. A small area within the addition will have a mezzanine floor. The exterior wall will be primarily glass façade. Based on conversations with Allied Engineering (project structural engineer) we understand column loads will vary, but will be on the order of 75 kips total load, or less.

Proposed construction is shown on the “Exploration Location Plan”, attached as Sheet 1.

2.0 EXPLORATION AND TESTING

2.1 Explorations

Five test borings (B-1 to B-5) were made at the site on November 11, 2015 by S. W. Cole Explorations, LLC of Londonderry, New Hampshire working under subcontract to S. W. Cole Engineering, Inc. (S.W.COLE). The boring locations were selected by others and established in the field by S.W.COLE. The approximate exploration locations are shown on Sheet 1. Logs of the explorations are attached as Sheets 2 through 6. A key to the notes and symbols used on the logs is attached as Sheet 7.

2.2 Testing

The borings were performed using hollow stem augers and the soils were sampled at 2 to 5 foot intervals using Standard Penetration Testing (SPT) techniques. Pocket Penetrometer Testing (PPT) was performed on samples of stiffer clay encountered at several borings. Soil samples obtained from the explorations were returned to our

laboratory for visual classification and testing. Laboratory testing included moisture content testing and grain size analyses. SPT blow counts, PPT readings, and moisture content test results are shown on the attached boring logs. Grain size analysis results are presented on Sheets 8 and 9.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Surficial Conditions

The site is located at the existing Northeast Air Terminal on the easterly side of Westbrook Street in Portland, Maine. The proposed terminal building addition is located on the northerly side of the existing Northeast Air terminal building in an area that is currently paved (former tarmac) and is at about elevation 60 feet (project datum). The proposed parking area is situated on the northwest side of the proposed addition. The area is currently occupied by the former Jetport terminal building (to be razed), paved parking and sidewalk areas, and landscaped areas. This area varies in elevation from about 60 feet near the proposed addition to about 63 feet in the northwest corner of the proposed parking area. Existing site features are shown on the "Exploration Location Plan" attached as Sheet 1.

3.2 Subsurface Conditions

Borings B-1 and B-2 were made for the proposed paved area. The explorations generally encountered about 12 and 8.5 inches of asphalt pavement, respectively, overlying about 4 inches of granular fill (pavement base). Below the granular base, Boring B-1 encountered about 5.5 feet of medium dense gravelly silty sand (fill) overlying medium dense glacial till. Below the pavement base, Boring B-2 encountered about 4 feet of fill or disturbed soil consisting of medium dense silty fine sand with a trace of organics overlying disturbed gray-brown silty clay. Native, very stiff brown silty clay was encountered at a depth of about 5 feet. Both borings were terminated at a depth of 10 feet below the existing pavement surface. It should be noted that a slight petroleum odor was noted in Boring B-2, sample S1.

Borings B-3, B-4 and B-5 were made at the location of the proposed addition. Borings B-3 and B-5 encountered about 12 inches of asphalt and concrete pavement overlying about 12 inches of medium dense sandy gravel or gravelly sand with a trace silt (pavement base). Boring B-4 encountered about 4.5 inches of asphalt pavement overlying about 2.5 feet of loose silty sand with some gravel (fill). Below the fill, each of these borings encountered very stiff brown silty clay which extends to depths of about 8, 11 and 11 feet, respectively. Borings B-4 and B-5 encountered medium to stiff brown silty clay with some

sand layers from about 11 to 13 feet transitioning to loose silty sand with some clay from about 13 to 16 feet. Borings B-3, B-4 and B-5 encountered medium dense glacial till or till-like soil at depths of about 11, 16 and 16 feet, respectively. Boring B-3 was terminated in the glacial till (not refusal) at a depth of 17 feet. Borings B-4 and B-5 encountered probable weathered bedrock at depths of 25.3 and 26.5 feet, respectively. Hollow-stem augers were used to penetrate the probable bedrock and were terminated (practical refusal) at depths of 30 and 25.2 feet, respectively. It should be noted that a slight petroleum odor was noted in Boring B-4, sample S1.

Refer to the attached logs for more detailed descriptions of the subsurface findings.

3.3 Groundwater Conditions

In general, the soils at Borings B-1 and B-2 were moist to wet. Wet to saturated soils were encountered at Boring B-1 at a depth of about 8 feet. Borings B-3, B-4 and B-5 encountered moist soils, becoming saturated with depth. Free water was observed at depths of about 8, 10 and 13 feet at these borings, respectively. Long term groundwater information is not available. It should be anticipated that seasonal groundwater levels will fluctuate, especially during periods of snowmelt and precipitation. Water likely perches atop the clayey soils seasonally and during periods of heavy precipitation and snowmelt.

4.0 EVALUATION AND RECOMMENDATIONS

4.1 General Findings

Based on the subsurface findings, the proposed construction appears feasible from a geotechnical standpoint. The principle geotechnical considerations are:

- Spread footing foundations and on-grade floor slabs bearing on properly prepared subgrades appear appropriate for the proposed building addition construction. All spread footings should bear on at least 6-inches of compacted Crushed Stone wrapped in a non-woven geotextile fabric such as Mirafi 160N overlying native, undisturbed stiff silty clay.

- An exterior perimeter foundation underdrain should be provided for the proposed building addition.

- Imported Structural Fill, Crushed Stone and Gravel Borrow will be needed for construction. The existing silty and clayey fill soils and native silty clay soils are unsuitable for reuse as fill or backfill in building and pavement areas.

- Imported Structural Fill and Gravel Borrow can be used as granular backfill in the depression left after removal of the former terminal building foundations. Portions of the existing granular fill at the site may also be suitable for backfilling the depression and to raise site grades, as needed.

- Geotextile fabric may be needed on the exposed pavement subgrades and subgrade beneath the existing building to be razed prior to placing new compacted fills, depending upon subgrade conditions at the time of construction.

- A representative of S.W.COLE should observe subgrades prior to placing new fills and concrete.

4.2 Site and Subgrade Preparation

We recommend that site preparation begin with the construction of an erosion control system to protect adjacent drainage ways and areas outside the construction limits. As much vegetation as possible should remain outside the construction areas to lessen the potential for erosion and site disturbance.

All topsoil, disturbed soils, pavements, fill soils, foundations and utilities must be completely removed from beneath the proposed building addition. The over-excavation should occur downward and outward at a 1H:1V bearing splay from the edge of foundations. S.W.COLE should observe exposed subgrades prior to placement of geotextile fabric, new fills and footings.

All topsoil and organics should be removed from below the proposed paved areas. Pavement subgrades consisting of existing fills should be proof-rolled with 3 to 5 passes of a vibratory roller having a static weight of at least 10 tons. Areas which become soft or yielding should be overexcavated and replaced with compacted Structural Fill or Gravel Borrow. S.W.COLE should observe the proof-rolling. Pavement subgrades which consist of native silty or clayey soil should be excavated with a smooth edged bucket and left undisturbed. Woven geotextile may be needed over silty or clayey pavement subgrades.

4.3 Excavation and Dewatering

Excavation work will generally encounter topsoil, pavements, granular fill, silty and clayey fill and silty clay. Saturated soils and groundwater will likely be encountered with depth and during periods of precipitation and/or snowmelt. Care must be exercised during

construction to limit disturbance of the bearing soils. Earthwork and grading activities should occur during drier summer and fall seasons. Construction equipment should not operate directly on the native subgrade soils. Final cuts to subgrade elevation in soil should be performed with a smooth-edged bucket to help reduce soil disturbance.

Sumping and pumping dewatering techniques should be adequate to control groundwater in shallower excavations. Controlling the water levels to at least 1 foot below planned excavation depths will help stabilize subgrades during construction. Excavations must be properly shored or sloped in accordance with OSHA regulations to prevent sloughing and caving of the sidewalls during construction. Care must be taken to preclude undermining adjacent structures, utilities and roadways.

4.4 Foundations

We recommend the proposed building addition be supported on spread footings founded on at least 6-inches of Crushed Stone wrapped in a non-woven geotextile fabric such as Mirafi 160N overlying undisturbed, native, stiff silty clay subgrades. We recommend the following geotechnical parameters for design consideration:

- Design Frost Depth = 4.5 feet
- Allowable Soil Bearing Pressure = 2.5 ksf (Crushed Stone overlying stiff silty clay)
- Seismic Site Soil Class = D (IBC 2009)
- Base Friction Factor = 0.40 (compacted Crushed Stone)
- Lateral Earth Pressure = 65 pcf (equivalent fluid pressure)
- Unit Weight of Backfill = 130 pcf (compacted Structural Fill)
- At-Rest Lateral Earth Pressure Coefficient = 0.5 (compacted Structural Fill)
- Internal Friction Angle of Backfill = 30° (compacted Structural Fill)

With proper subgrade preparation, we estimate post-construction settlement beneath a typical column will be about 3/4-inch, or less, with differential settlement on the order of ½ inch in 25 feet. Footings should be at least 24-inches in width regardless of bearing pressure.

4.5 Foundation Drainage

We recommend an underdrain system be installed within the outside edge of the geotextile fabric wrapped Crushed Stone layer recommended below perimeter footings. The underdrain pipe should consist of 4-inch diameter, perforated SDR-35 foundation drain pipe. The underdrain systems must have positive gravity outlet(s) protected from

freezing, clogging and backflow. Surface grades should be sloped away from the buildings for positive surface water drainage. A general underdrain detail is illustrated on Sheet 10.

4.6 Slab-On-Grade

On-grade floor slabs in heated areas may be designed using a subgrade reaction modulus of 150 pci (pounds per cubic inch) provided the slab is underlain by at least 12-inches of compacted Structural Fill overlying properly prepared subgrades. The structural engineer or concrete consultant must design steel reinforcing and joint spacing appropriate to slab thickness and function.

We recommend a sub-slab vapor retarder particularly in areas of the buildings where the concrete slab will be covered with an impermeable surface treatment or floor covering that may be sensitive to moisture vapors. The vapor retarder must have a permeance that is less than the floor cover or surface treatment that is applied to the slab. The vapor retarder must have sufficient durability to withstand direct contact with the sub-slab base material and construction activity. The vapor retarder material shall be placed according to the manufacturer's recommended method, including the taping and lapping of all joints and wall connections. The architect and/or flooring consultant should select the vapor retarder products compatible with flooring and adhesive materials.

The floor slab should be appropriately cured using moisture retention methods after casting. Typical floor slab curing methods should be used for at least 7 days. The architect or flooring consultant should assign curing methods consistent with current applicable American Concrete Institute (ACI) procedures with consideration of curing method compatibility to proposed surface treatments, flooring and adhesive materials.

4.7 Entrance Slabs

Entrance slabs adjacent to the addition must be designed to reduce the effects of differential frost action between adjacent pavement, doorways, and sidewalks. We recommend that clean, non-frost susceptible sand and gravel meeting the requirements of Structural Fill be provided to a depth of at least 4.5 feet below the top of entrance slabs. This thickness of Structural Fill should extend the full width of the entrance slabs and outward at least 4.5 feet, thereafter transitioning up to the bottom of the adjacent sidewalk or pavement subbase gravel at a 3H:1V or flatter slope. General details of this frost transition zone are illustrated on Sheet 10.

4.8 Backfill and Compaction

Based on the findings at the explorations, the existing silty and clayey fill and silty clay soils are not suitable for reuse as fill or backfill in building or paved areas. However, the existing granular fill encountered beneath the pavements is likely suitable for subgrade fill (Gravel Borrow). We recommend the following fill and backfill materials for use during construction:

Structural Fill: Clean, non-frost susceptible, sand and gravel, free of organics and other deleterious materials meeting the following gradation:

Structural Fill	
Sieve Size	Percent Finer by Weight
4 Inch	100
3 Inch	90 to 100
¼ Inch	25 to 90
#40	0 to 30
#200	0 to 5

Structural Fill is recommended for:

- Subgrade fill to raise proposed building and paved areas
- Backfill for foundations
- Slab-on-grade base material
- Backfill within the frost-free transition zones for building entrances and sidewalks

Crushed Stone: Crushed Stone used around underdrains and beneath all footings should consist of crushed rock meeting the gradation requirements of the MDOT Standard Specifications 703.22 “Underdrain Backfill Type C”.

Gravel Borrow: Gravel Borrow should meet the gradation requirements for MDOT 703.20. Gravel Borrow can be used to backfill depressions left from removal of existing foundations. Gravel Borrow can be also used as subgrade fill beneath paved and landscaped areas (non-building areas), as needed.

Placement and Compaction: Fill should be placed in horizontal lifts and compacted such that the desired density is achieved throughout the lift thickness with 3 to 5 passes of the compaction equipment. Loose lift thicknesses for grading, fill and backfill

activities should not exceed 12 inches. We recommend that fill and backfill be compacted to at least 95 percent of its maximum dry density as determined by ASTM D-1557. Crushed Stone should be compacted in loose lifts not exceeding 12-inches with 2 to 4 passes of a vibratory plate compactor with a static weight of at least 600 lbs.

4.9 Paved Areas

We anticipate that the paved parking lot will be subjected primarily to passenger car traffic. We offer the following pavement sections for your consideration. The materials are based on Maine Department of Transportation Specifications.

Standard Duty Pavement (Passenger Car and Light Delivery Truck Traffic)	
Maine DOT 9.5 mm Superpave 703.09 (50 gyration design)	1.25 Inches
Maine DOT 19.0 mm Superpave 703.09 (50 gyration design)	2.25 Inches
Maine DOT Crushed Aggregate Base 703.06 Type A	6 Inches
Maine DOT Aggregate Subbase 703.06 Type D	12 Inches

Bituminous pavement should be compacted to 92 to 97 percent of its theoretical maximum density as determined by ASTM D-2041. Tack coat is recommended between lifts of asphalt pavement. Base and subbase materials should be compacted according to Section 4.8. Paved areas should be graded to promote surface drainage away from structures.

Frost penetration can be on the order of 4.5 feet or more in this area. In the absence of full depth excavation of frost susceptible soils or use of insulation, frost will penetrate into the subgrade and some frost heaving and pavement distress must be anticipated.

4.10 Weather Considerations

Construction activity should be limited during wet weather and the site soils may require drying before construction activities may continue. The contractor should anticipate the need for water to temper fills in order to facilitate compaction during dry weather. If construction takes place during cold weather, subgrades, foundations and floor slabs must be protected during freezing conditions. Concrete and fill must not be placed on frozen soil; and once placed, the concrete and soil beneath the structure must be protected from freezing.

4.11 Design Review and Construction Testing

S.W.COLE should be retained to review the final design and specifications to determine that our earthwork and foundation recommendations have been properly interpreted and implemented.

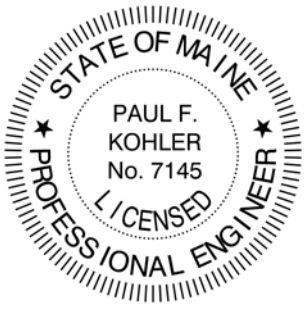
A soils and concrete testing program should also be implemented during construction to observe compliance with the design concepts, plans, and specifications. S.W.COLE is available to provide subgrade observations for foundations as well as special inspection and material testing services for soils, concrete and asphalt construction materials.

5.0 CLOSURE

It has been a pleasure to be of assistance to you with this phase of your project. We look forward to working with you during the construction phase of the project.

Sincerely,

S. W. Cole Engineering, Inc.



Paul F. Kohler, P.E.
Senior Geotechnical Engineer

PFK-rec/emw:jlm

C: Mike Hayes, AIA – Grant Hayes Associates, Inc.
Bill Faucher, P.E. – Allied Engineering, Inc.

Attachment A
Limitations

This report has been prepared for the exclusive use of Northeast Airmotive for specific application to the proposed Terminal Addition and proposed paved areas project at 1011 Westbrook Street in Portland, Maine. S. W. Cole Engineering, Inc. (S.W.COLE) has endeavored to conduct our services in accordance with generally accepted soil and foundation engineering practices. No warranty, expressed or implied, is made.

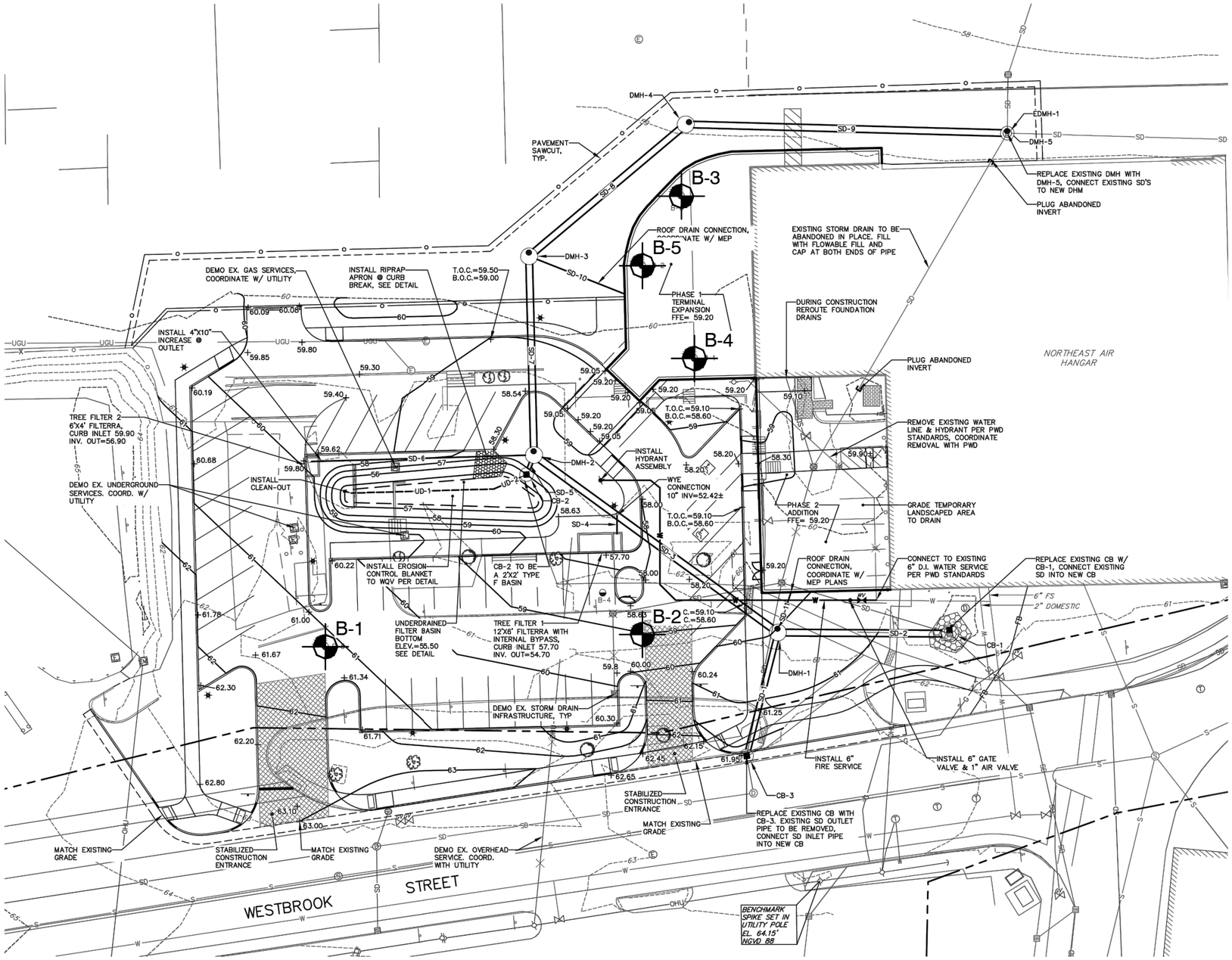
The soil and bedrock profiles described in the report are intended to convey general trends in subsurface conditions. The boundaries between strata are approximate and are based upon interpretation of exploration data and samples.

The analyses performed during this investigation and recommendations presented in this report are based in part upon the data obtained from subsurface explorations made at the site. Variations in subsurface conditions may occur between explorations and may not become evident until construction. If variations in subsurface conditions become evident after submission of this report, it will be necessary to evaluate their nature and to review the recommendations of this report.

Observations have been made during exploration work to assess site groundwater levels. Fluctuations in water levels will occur due to variations in rainfall, temperature, and other factors.

S.W.COLE's scope of services has not included the investigation, detection, or prevention of any Biological Pollutants at the project site or in any existing or proposed structure at the site. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and the byproducts of any such biological organisms.

Recommendations contained in this report are based substantially upon information provided by others regarding the proposed project. In the event that any changes are made in the design, nature, or location of the proposed project, S.W.COLE should review such changes as they relate to analyses associated with this report. Recommendations contained in this report shall not be considered valid unless the changes are reviewed by S.W.COLE.



LEGEND:

APPROXIMATE BORING LOCATION

NOTES:

1. EXPLORATION LOCATION PLAN WAS PREPARED FROM A 1"=20' SCALE PLAN OF THE SITE ENTITLED "GRADING AND UTILITY PLAN", PREPARED BY SEBAGO TECHNICS, DATED 9-30-15.
2. THE BORINGS WERE LOCATED IN THE FIELD BY SURVEY BY SEBAGO TECHNICS AND PROVIDED ON THE ABOVE REFERENCED PLAN. B-5 WAS MOVED TO THE PAVEMENT (ABOUT 5' WEST)
3. THIS PLAN SHOULD BE USED IN CONJUNCTION WITH THE ASSOCIATED S. W. COLE ENGINEERING, INC. GEOTECHNICAL REPORT.
4. THE PURPOSE OF THIS PLAN IS ONLY TO DEPICT THE LOCATION OF THE EXPLORATIONS IN RELATION TO THE EXISTING CONDITIONS AND PROPOSED CONSTRUCTION AND IS NOT TO BE USED FOR CONSTRUCTION.

S.W.COLE ENGINEERING, INC.

NORTHEAST AIRMOTIVE

EXPLORATION LOCATION PLAN

PROPOSED NE AIR TERMINAL ADDITION & PARKING
PORTLAND INTERNATIONAL JETPORT
PORTLAND, MAINE

Job No.:	15-1090	Scale:	1" = 40'
Date :	11/19/2015	Sheet:	1

S.W.COLE ENGINEERING, INC.

BORING LOG

BORING NO.: **B-1**
SHEET: OF
PROJECT NO.: 15-1090
DATE START: 11/11/2015
DATE FINISH: 11/11/2015
ELEVATION: ±62'
SWC REP.: PFK

PROJECT / CLIENT: PROPOSED NE AIR TERMINAL ADDITION & PARKING / NORTHEAST AIRMOTIVE
LOCATION: PORTLAND, MAINE
DRILLING CO. : S. W. COLE EXPLORATIONS, LLC
DRILLER: KEVIN HANSCOM

	TYPE	SIZE I.D.	HAMMER WT.	HAMMER FALL
CASING:	H S A	2 1/4"		
SAMPLER:	SS	1 3/8"	140lbs	30"
CORE BARREL:				

WATER LEVEL INFORMATION
WET TO SATURATED AT ±8'

CASING BLOWS PER FOOT	SAMPLE NO.	PEN.	REC.	DEPTH @ BOT	SAMPLER BLOWS PER 6" 0-6	6-12	12-18	18-24	DEPTH	STRATA & TEST DATA
										±12" ASPHALT PAVEMENT
									1.4'	BROWN SAND AND GRAVEL, TRACE SILT (FILL)
	S1	24"	8"	3.0'	9	7	5	7		LIGHT AND DARK BROWN GRAVELLY SILTY SAND (FILL)
	S2	24"	20"	5.0'	9	9	15	14		~MEDIUM DENSE~
									6.0'	
	S3	24"	21"	7.0'	9	11	8	11		~MEDIUM DENSE~
										LIGHT GRAY SILTY SAND, SOME GRAVEL, SOME COBBLES
										(GLACIAL TILL) w=10.1%
	S4	24"	20"	10.0'	9	7	10	12	10.0'	
										BOTTOM OF EXPLORATION AT 10'

SAMPLES:
D = SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:
[ ] DRILLER - VISUALLY
[X] SOIL TECH. - VISUALLY
[X] LABORATORY TEST

REMARKS:
STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

BORING NO.: **B-1**

S.W.COLE ENGINEERING, INC.

BORING LOG

BORING NO.: **B-2**
SHEET: 1 OF 1
PROJECT NO.: 15-1090

PROJECT / CLIENT: PROPOSED NE AIR TERMINAL ADDITION & PARKING / NORTHEAST AIRMOTIVE
LOCATION: PORTLAND, MAINE
DRILLING CO. : S. W. COLE EXPLORATIONS, LLC DRILLER: KEVIN HANSCOM

DATE START: 11/11/2015
DATE FINISH: 11/11/2015
ELEVATION: ±61'
SWC REP.: PFK

	TYPE	SIZE I.D.	HAMMER WT.	HAMMER FALL
CASING:	H S A	2 1/4"		
SAMPLER:	SS	1 3/8"	140lbs	30"
CORE BARREL:				

WATER LEVEL INFORMATION
SOILS MOIST
NO FREE WATER OBSERVED

CASING BLOWS PER FOOT	SAMPLE NO.	PEN.	REC.	DEPTH @ BOT	SAMPLER BLOWS PER 6" 0-6	6-12	12-18	18-24	DEPTH	STRATA & TEST DATA
										8.5" ASPHALT PAVEMENT
									1.1'	BROWN GRAVELLY SAND, SOME SILT (FILL)
	S1	24"	15"	3.0'	8	4	3	4	3.0'	~MEDIUM DENSE~
										GRAY CLAYEY SILTY FINE SAND, TRACE ORGANICS (FILL)
	S2	24"	24"	5.0'	6	7	10	12	5.0'	~VERY STIFF~ q_p=8ksf
										GRAY-BROWN SILTY CLAY (POSSIBLE FILL/DISTURBED)
	S3	24"	20"	7.0'	12	12	12	14		~VERY STIFF~ w=22.7%
										GRAY-BROWN SILTY CLAY q_p=9ksf
										WITH THIN SAND SEAMS
	S4	24"	24"	10.0'	4	8	9	11	10.0'	
										BOTTOM OF EXPLORATION AT 10'

NOTE: SLIGHT PETROLEUM ODOR IN SAMPLE S1

SAMPLES:
D = SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:
[ ] DRILLER - VISUALLY
[X] SOIL TECH. - VISUALLY
[X] LABORATORY TEST

REMARKS:
STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

BORING NO.: **B-2**

S.W.COLE ENGINEERING, INC.

BORING LOG

BORING NO.: **B-3**
SHEET: 1 OF 1
PROJECT NO.: 15-1090

PROJECT / CLIENT: PROPOSED NE AIR TERMINAL ADDITION & PARKING / NORTHEAST AIRMOTIVE
LOCATION: PORTLAND, MAINE
DRILLING CO. : S. W. COLE EXPLORATIONS, LLC DRILLER: KEVIN HANSCOM

DATE START: 11/11/2015
DATE FINISH: 11/11/2015
ELEVATION: ±60'
SWC REP.: PFK

	TYPE	SIZE I.D.	HAMMER WT.	HAMMER FALL
CASING:	H S A	2 1/4"		
SAMPLER:	SS	1 3/8"	140lbs	30"
CORE BARREL:				

WATER LEVEL INFORMATION
CAVED AT 9.7' UPON COMPLETION
FREE WATER AT ±8.0'

CASING BLOWS PER FOOT	SAMPLE NO.	PEN.	REC.	DEPTH @ BOT	SAMPLER BLOWS PER 6" 0-6	6-12	12-18	18-24	DEPTH	STRATA & TEST DATA
									1.0'	4" ASPHALT PAVEMENT OVERLYING 8" CONCRETE PAVEMENT
									2.0'	BROWN SANDY GRAVEL, TRACE SILT (FILL) ~MED. DENSE~
	S1	24"	2"	3.0'	9	7	6	5		
										~VERY STIFF~
										GRAY-BROWN SILTY CLAY (DESSICATED)
	S2	24"	18"	7.0'	4	5	9	11		q_p=9ksf
									8.0'	
										~LOOSE TO MEDIUM DENSE~
										GRAY SILTY SAND , SOME CLAY WITH SOME COBBLES
	S3	24"	1"	10.1'	25/1				11.0'	
										GRAY GRAVELLY SILTY SAND, SOME CLAY (TILL)
										…MEDIUM DENSE~
										w=11.5%
	S4	24"	18"	17.0'	2	6	9	11	17.0'	
										BOTTOM OF EXPLORATION AT 17'
										NOTE: COBBLE AT ±10'. PUSHED AUGERS HORIZONTALLY-
										TERMINATED BORING AT 17'

SAMPLES:
D = SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:
[ ] DRILLER - VISUALLY
[X] SOIL TECH. - VISUALLY
[X] LABORATORY TEST

REMARKS:
STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

BORING NO.: **B-3**

S.W.COLE ENGINEERING, INC.

BORING LOG

BORING NO.: **B-4**
SHEET: 1 OF 1
PROJECT NO.: 15-1090

PROJECT / CLIENT: PROPOSED NE AIR TERMINAL ADDITION & PARKING / NORTHEAST AIRMOTIVE
LOCATION: PORTLAND, MAINE
DRILLING CO. : S. W. COLE EXPLORATIONS, LLC DRILLER: KEVIN HANSCOM

DATE START: 11/11/2015
DATE FINISH: 11/11/2015
ELEVATION: ±60'
SWC REP.: PFK

	TYPE	SIZE I.D.	HAMMER WT.	HAMMER FALL
CASING:	H S A	2 1/4"		
SAMPLER:	SS	1 3/8"	140lbs	30"
CORE BARREL:				

WATER LEVEL INFORMATION
WATER @ ±10.2'
CAVE AT 20.5 UPON COMPLETION

CASING BLOWS PER FOOT	SAMPLE NO.	PEN.	REC.	DEPTH @ BOT	SAMPLER BLOWS PER 6" 0-6	6-12	12-18	18-24	DEPTH	STRATA & TEST DATA
										4.5" ASPHALT PAVEMENT
										~LOOSE~
	S1	24"	10"	2.5'	3	2	2	2	3.0'	DARK BROWN SILTY SAND, SOME GRAVEL (FILL)
										~VERY STIFF~
	S2	24"	18"	4.5'	3	5	7	10		BROWN SILTY CLAY (DESSICATED) q_p=7 to 8ksf
	S3	24"	20"	7.0'	3	6	7	10		w=25.9% q_p=6 to 8ksf
										q_p=4 to 6ksf
									11.0'	
	S4	24"	20"	12.0'	2	3	3	4		~MEDIUM~
									13.0'	BROWNISH-GRAY SILTY CLAY q_p=1 to 2ksf
										BROWNISH-GRAY SILTY SAND, SOME CLAY, TRACE GRAVEL
										~LOOSE~
									16.0'	w=16.3%
	S5	24"	16"	17.0'	2	4	7	6		BROWNISH-GRAY GRAVELLY SILTY SAND (TILL)
										…MEDIUM DENSE~
									20.0'	
	S6	24"	14"	22.0'	5	8	9	11		~MEDIUM DENSE~
										GRAY GRAVELLY SILTY SAND, TRACE CLAY (TILL)
									25.3'	
	S7	24"	2"	25.3'	50/3"					SPOON REFUSAL AT 25.3'
										AUGERED INTO PROBABLE WEATHERED BEDROCK 25.3' TO 30'
									30.1'	
	S8	24"	0"	30.1'	50/1"					BOTTOM OF EXPLORATION AT 30.1'
										(SPOON REFUSAL - PROBABLE BEDROCK)
										NOTE: SLIGHT PETROLEUM ODOR IN S1

SAMPLES:
D = SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:
[ ] DRILLER - VISUALLY
[X] SOIL TECH. - VISUALLY
[X] LABORATORY TEST

REMARKS:
STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

BORING NO.: **B-4**

S.W.COLE ENGINEERING, INC.

BORING LOG

BORING NO.: **B-5**
SHEET: 1 OF 1
PROJECT NO.: 15-1090

PROJECT / CLIENT: PROPOSED NE AIR TERMINAL ADDITION & PARKING / NORTHEAST AIRMOTIVE
LOCATION: PORTLAND, MAINE
DRILLING CO. : S. W. COLE EXPLORATIONS, LLC DRILLER: KEVIN HANSCOM

DATE START: 11/11/2015
DATE FINISH: 11/11/2015
ELEVATION: ±60'
SWC REP.: PFK

	TYPE	SIZE I.D.	HAMMER WT.	HAMMER FALL
CASING:	H S A	2 1/4"		
SAMPLER:	SS	1 3/8"	140lbs	30"
CORE BARREL:				

WATER LEVEL INFORMATION
WATER @ ±13'

CASING BLOWS PER FOOT	SAMPLE NO.	PEN.	REC.	DEPTH @ BOT	SAMPLER BLOWS PER 6" 0-6	6-12	12-18	18-24	DEPTH	STRATA & TEST DATA
									1.0'	3.5" ASPHALT PAVEMENT OVERLYING 8" CONCRETE PAVEMENT
									1.8'	BROWN SAND WITH GRAVEL, TRACE SILT (FILL)
	S1	24"	15"	3'	7	7	5	6		~VERY STIFF~
										q_p=9ksf
	S2	24"	24"	5'	7	10	14	14		BROWN SILTY CLAY (DESSICATED)
										q_p=8 to9ksf
	S3	24"	20"	7'	6	7	10	11		w=26.7%
									11.0'	q_p=5 to 6ksf
	S4	24"	24"	12'	3	4	6	6		~STIFF~
									13.0'	BROWNISH-GRAY SILTY CLAY WITH THIN SAND SEAMS q_p=4ksf
										~LOOSE~
										BROWNISH-GRAY CLAYEY SILTY SAND, TRACE GRAVEL
									16.0'	
	S5	24"	16"	17'	2	8	11	8		~MEDIUM DENSE~
										GRAY MEDIUM SAND, SOME GRAVEL, SOME SILT (TILL-LIKE)
									25.0'	
										~MEDIUM DENSE~
	S6	24"	15"	22'	4	6	7	27	26.5'	BROWNISH-GRAY SILTY SAND, SOME GRAVEL (TILL)
										AUGERED INTO PROBABLE WEATHERED BEDROCK
									25.2'	26.5' TO 25.2'
	S7	24"	2"	25.2'	50/2"					BOTTOM OF EXPLORATION AT 25.2'
										(SPOON REFUSAL - PROBABLE BEDROCK)

SAMPLES:
D = SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:
[ ] DRILLER - VISUALLY
[X] SOIL TECH. - VISUALLY
[X] LABORATORY TEST

REMARKS:
STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

BORING NO.: **B-5**

KEY TO THE NOTES & SYMBOLS
Test Boring and Test Pit Explorations

All stratification lines represent the approximate boundary between soil types and the transition may be gradual.

Key to Symbols Used:

w	-	water content, percent (dry weight basis)
q_u	-	unconfined compressive strength, kips/sq. ft. - based on laboratory unconfined compressive test
S_v	-	field vane shear strength, kips/sq. ft.
L_v	-	lab vane shear strength, kips/sq. ft.
q_p	-	unconfined compressive strength, kips/sq. ft. based on pocket penetrometer test
O	-	organic content, percent (dry weight basis)
W_L	-	liquid limit - Atterberg test
W_P	-	plastic limit - Atterberg test
WOH	-	advance by weight of hammer
WOM	-	advance by weight of man
WOR	-	advance by weight of rods
HYD	-	advance by force of hydraulic piston on drill
RQD	-	Rock Quality Designator - an index of the quality of a rock mass. RQD is computed from recovered core samples.
γ_T	-	total soil weight
γ_B	-	buoyant soil weight

Description of Proportions:

0 to 5% TRACE
5 to 12% SOME
12 to 35% "Y"
35+% AND

REFUSAL: **Test Boring Explorations** - Refusal depth indicates that depth at which, in the drill foreman's opinion, sufficient resistance to the advance of the casing, auger, probe rod or sampler was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

REFUSAL: **Test Pit Explorations** - Refusal depth indicates that depth at which sufficient resistance to the advance of the backhoe bucket was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

Although refusal may indicate the encountering of the bedrock surface, it may indicate the striking of large cobbles, boulders, very dense or cemented soil, or other buried natural or man-made objects or it may indicate the encountering of a harder zone after penetrating a considerable depth through a weathered or disintegrated zone of the bedrock.

S.W.COLE ENGINEERING, INC.

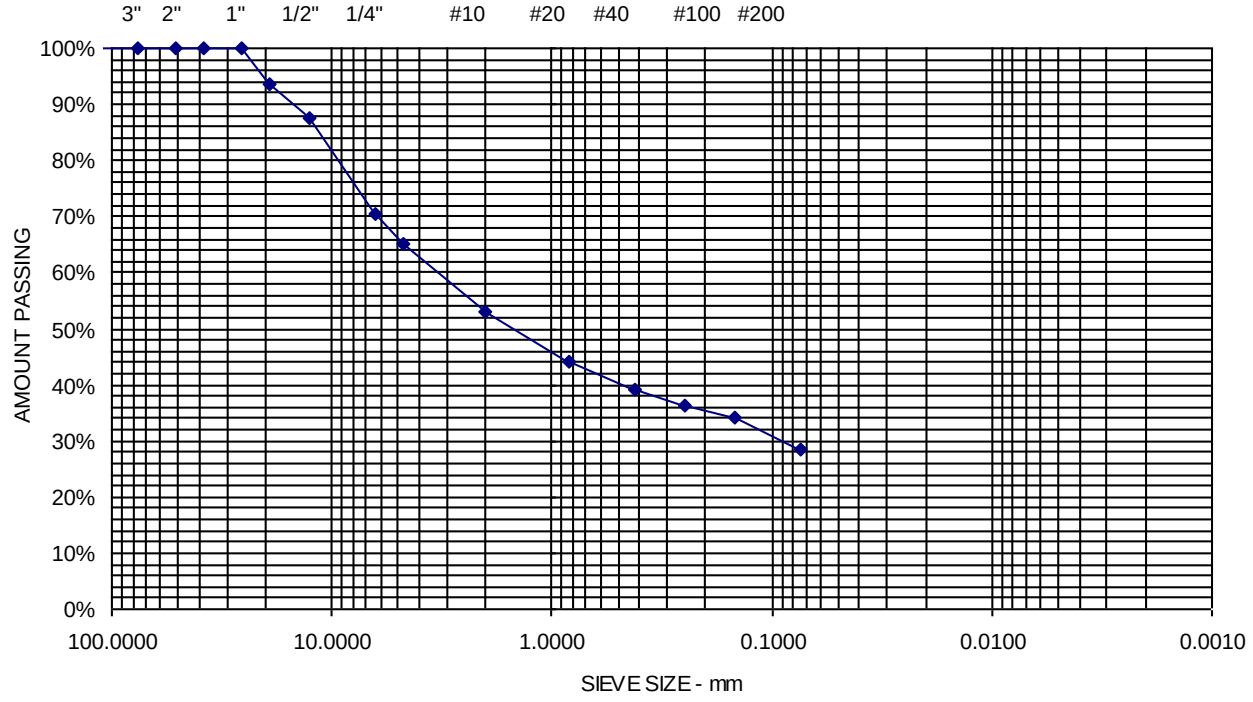
Report of Gradation

ASTM C-117 & C-136

Project Name	SOUTH PORTLAND ME - PROPOSED NORTHEAST AIR TERMINAL ADDITION AND PARKING- GEOTECHNICAL ENGINEERING	Project Number	15-1090
Client	NORTHEAST AIR	Lab ID	20243G
		Date Received	11/18/2015
		Date Completed	11/19/2015
Material Source	**B-1 S3 5-7'**	Tested By	JUSTIN BISSON

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
125 mm	**5"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**94**	
12.5 mm	**1/2"**	**88**	
6.3 mm	**1/4"**	**70**	
4.75 mm	**No. 4**	**65**	34.8% Gravel
2.00 mm	**No. 10**	**53**	
850 um	**No. 20**	**44**	
425 um	**No. 40**	**39**	36.8% Sand
250 um	**No. 60**	**36**	
150 um	**No. 100**	**34**	
75 um	**No. 200**	**28.3**	28.3% Fines

SILTY SAND AND GRAVEL



Comments: w = 10.1%

S.W.COLE ENGINEERING, INC.

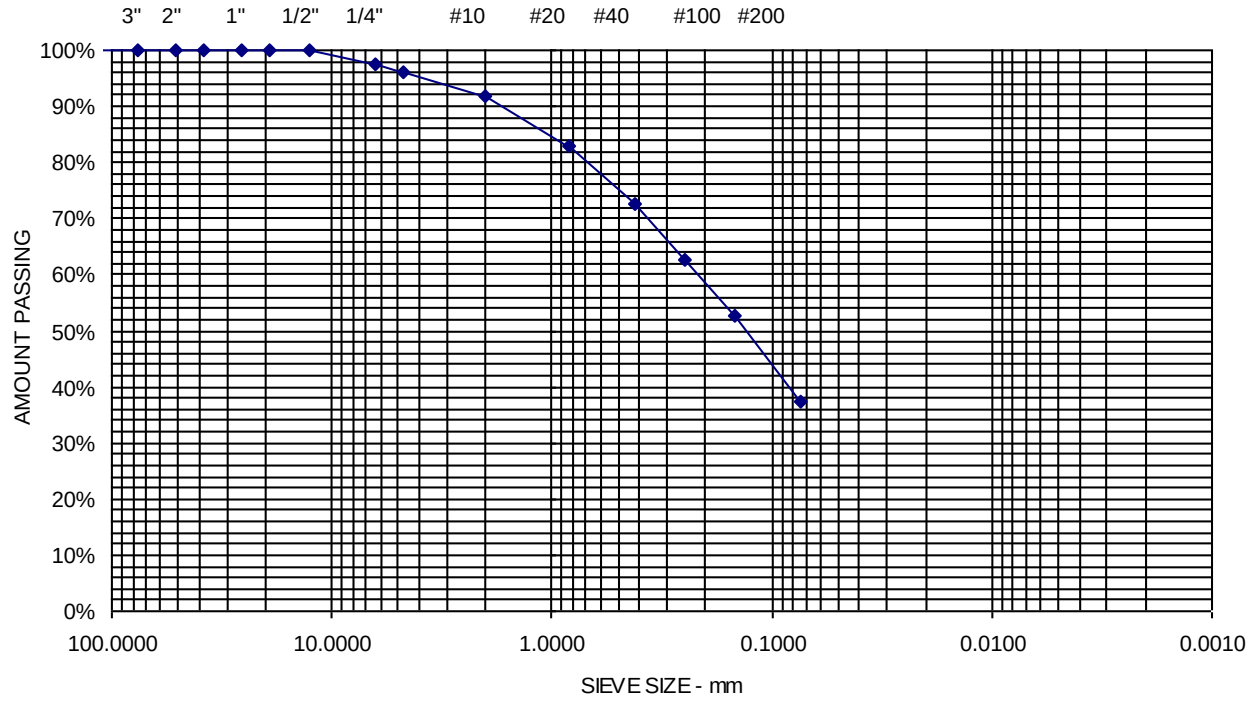
Report of Gradation

ASTM C-117 & C-136

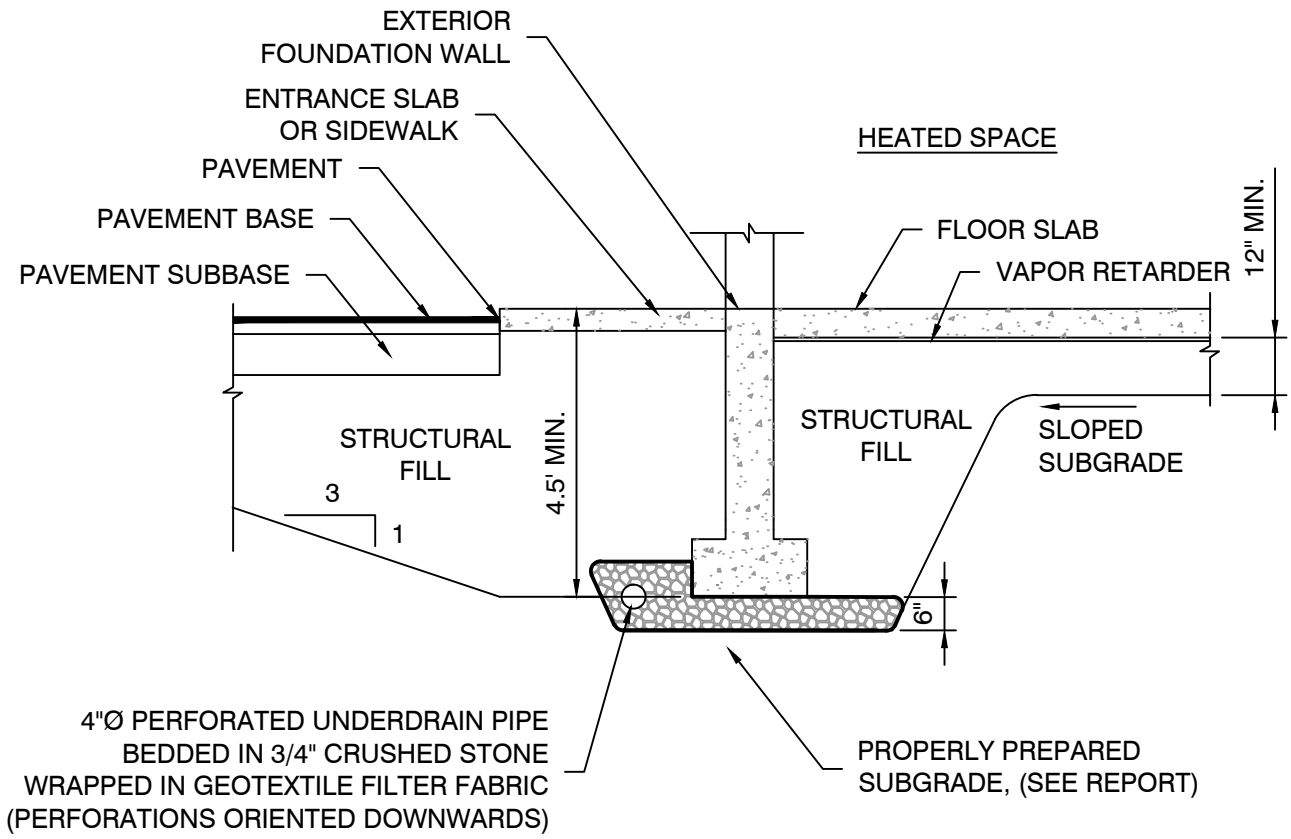
Project Name	SOUTH PORTLAND ME - PROPOSED NORTHEAST AIR TERMINAL ADDITION AND PARKING- GEOTECHNICAL ENGINEERING	Project Number	15-1090
Client	NORTHEAST AIR	Lab ID	20247G
		Date Received	11/18/2015
		Date Completed	11/19/2015
Material Source	**B-4 S5 15-17'**	Tested By	JUSTIN BISSON

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
125 mm	**5"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**100**	
12.5 mm	**1/2"**	**100**	
6.3 mm	**1/4"**	**97**	
4.75 mm	**No. 4**	**96**	4.1% Gravel
2.00 mm	**No. 10**	**92**	
850 um	**No. 20**	**83**	
425 um	**No. 40**	**73**	58.5% Sand
250 um	**No. 60**	**63**	
150 um	**No. 100**	**53**	
75 um	**No. 200**	**37.4**	37.4% Fines

SILTY SAND, SOME CLAY, TRACE GRAVEL



Comments: w = 16.3%



NOTE:

1. UNDERDRAIN INSTALLATION AND MATERIAL GRADATION RECOMMENDATIONS ARE CONTAINED WITHIN THIS REPORT.

2. DETAIL IS PROVIDED FOR ILLUSTRATIVE PURPOSES ONLY, NOT FOR CONSTRUCTION.

S.W.COLE ENGINEERING, INC.

NORTHEAST AIRMOTIVE

UNDERDRAIN DETAIL

PROPOSED NE AIR TERMINAL ADDITION & PARKING
PORTLAND INTERNATIONAL JETPORT
PORTLAND, MAINE

Job No.:	15-1090	Scale:	Not to Scale
Date :	12/08/2015	Sheet:	10